

Stormwater Runoff | Overview of Engineered Solutions for Stormwater Management

Industrial, commercial, or municipal facilities with large impervious surface areas such as parking lots, large building roofs, and roadways, may require engineered structures to address stormwater runoff that flows to nearby surface water bodies. Pollutants from vehicles, sediment from land erosion, nutrients such as nitrogen and phosphorus from the application of fertilizer, and pesticides from agricultural and lawn maintenance can all be washed into nearby surface water bodies via stormwater sewers and/or overland flow.

Best Management Practices (BMPs) have been developed to address the negative impacts from stormwater runoff. The BMPs generally use one or more of the following approaches:

1. Replacing impermeable surfaces with pervious surfaces to let precipitation infiltrate directly into the ground surface
2. Constructing structures to slow, intercept, and retain stormwater flows so that the runoff from impermeable surfaces is intercepted, retained, and allowed to infiltrate into the ground within the created structure
3. Installing constructed systems that employ vegetation or other filtration media to slow and/or intercept overland flow, filter pollutants out of the stormwater, and allow it to infiltrate into the ground

The New Hampshire Stormwater Manual (NHDES, December, 2008) (https://www.des.nh.gov/organization/divisions/water/stormwater/documents/wd-08-20c_covr.pdf) provides guidance on the construction of BMPs and the relative efficiencies of various BMPs in removing total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP) from stormwater. There is a great deal of flexibility in the design of BMPs, depending upon location, available space, topography, maintenance factors, and funds available. BMPs can be designed to be strictly functional, or can incorporate aesthetic qualities, adding beauty to the landscape.

This pamphlet provides some examples of just a few of the types of engineered BMPs that can be used to treat stormwater.

GREEN ROOF

A green roof is a building roof that is partially or completely covered with vegetation and soil, or other type of growing medium. Vegetation is planted in a substrate over a drainage layer and a root barrier membrane.



Photo credit: Green Roof Plants

Pervious Pavement

Permeable pavement consists of a porous surface, base, and sub-base materials which allow penetration of runoff through the surface into underlying soils.



Photo credit: Philadelphia Water Department

STORMWATER FRIENDLY DRIVEWAYS

Stormwater friendly driveways are designed to allow water to soak away into the ground below, where it is filtered by the soil and can recharge groundwater, keep pollutants out of streams and lakes and reduce flooding risks. They can be constructed of pervious pavement, pavers, honeycomb-like grids, or narrow ribbons of pavement.



VEGETATED BUFFER

Vegetated buffers are areas of natural or established vegetation along the shoreline of a water body that are allowed to grow with minimal to no maintenance.



Photo credit: 2030 Palette

INFILTRATION TRENCH

An infiltration trench is a stone-filled excavation used to temporarily store runoff and allow it to infiltrate into surrounding, natural soil.



Photo credit: arlingtonva.us

SUBSURFACE INFILTRATION SYSTEMS

A dry well is essentially small subsurface leaching basin. It consists of a small pit filled with stone, or a small structure surrounded by stone, used to temporarily store and infiltrate runoff from a very limited contributing area. A



RAIN GARDENS, BIOSWALES AND BIORETENTION CELLS

Rain gardens and bioswales are simple landscaping features used to slow, collect, infiltrate, and filter stormwater. These structures mimic natural hydrology by infiltrating, evaporating, and transpiring stormwater runoff. Rain gardens are generally smaller and more appropriate for residential systems than bioswales. More complex rain gardens with drainage systems and amended soils are often referred to as bioretention cells.



Photo credit: Blue-Green Building

FILTERING PRACTICES

Filtering practices treat stormwater runoff by capturing and passing the water quality volume through a bed of sand, other soil material, or other acceptable treatment media to remove pollutants from the water. Sediments and other pollutants are removed by physical straining and absorption.



GRAVEL WETLANDS

The gravel wetland system consists of one or more flow-through constructed wetland cells, preceded by a sedimentation basin. The cells are filled with a gravel media, supporting an organic substrate that is planted with wetland vegetation. Water quality treatment occurs through microbial, chemical, and physical processes within this media. Whereas rain gardens and bioretention basins are designed to drain and remain dry between rainstorms, gravel wetlands are designed to retain sufficient water to support wetland vegetation.



Photo credit: uidaho.edu

